

## **AMENDMENTS TO THE CLAIMS**

**This listing of claims will replace all prior versions and listings of claims in the application:**

### **LISTING OF CLAIMS:**

Claims 1-10 (cancelled).

11. (Currently Amended) A method for an optimal one-shot phase and frequency estimation for timing acquisition for signals transmitted over a communications channel, the method comprising:

sampling a preamble comprising a known string of data bits;

estimating the sampled preamble ( $\bar{Y}$ ), the estimated preamble further comprising an estimated amplitude ( $\hat{A}$ ), an estimated frequency ( $\hat{f}$ ), and an estimated phase ( $\hat{\Phi}$ );

calculating a cost function ( $C(\hat{f}, \hat{\Phi})$ ) as a function of the estimated frequency ( $\hat{f}$ ) and the estimated phase ( $\hat{\Phi}$ );

varying at least one of the estimated frequency ( $\hat{f}$ ) or estimated phase ( $\hat{\Phi}$ ) to

calculate a plurality of cost functions; and

selecting the cost function ( $C(\hat{f}, \hat{\Phi})$ ) having a minimum value, wherein said cost function having the minimum value is a function of an optimal estimated frequency ( $\hat{f}$ ) and an optimal estimated

phase ( $\hat{\Phi}$ ). ~~The method of claim 1,~~ wherein selecting the minimum value cost function further comprises selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated frequency ( $\hat{f}$ ).

12. (Original) The method of claim 11, wherein selecting the minimum value cost function further comprises selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency ( $\hat{f}$ ) and an optimal estimated phase ( $\hat{\Phi}$ ).

13. (Currently Amended) The method of claim [4]11, wherein selecting the minimum value cost function further comprises selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated phase ( $\hat{\Phi}$ ).

14. (Original) The method of claim 13, wherein selecting the minimum value cost function further comprises selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency ( $\hat{f}$ ) and an optimal estimated phase ( $\hat{\Phi}$ ).

Claims 15-24 (cancelled).

25. (Currently Amended) A communications channel for an optimal one-shot phase and frequency estimation for timing acquisition for signals transmitted over the communications channel, the communications channel comprising:

a sampler for sampling a preamble comprising a known string of data bits;

a first calculator for estimating the sampled preamble ( $\bar{Y}$ ), the estimated preamble further comprising an estimated amplitude ( $\hat{A}$ ), an estimated frequency ( $\hat{f}$ ), and an estimated phase ( $\hat{\Phi}$ );

a second calculator for calculating a plurality of cost functions ( $C(\hat{f}, \hat{\Phi})$ ) as a function of the estimated frequency ( $\hat{f}$ ) and the estimated phase ( $\hat{\Phi}$ ) by varying at least one of the estimated frequency ( $\hat{f}$ ) or estimated phase ( $\hat{\Phi}$ ); and

a selector for determining the cost function ( $C(\hat{f}, \hat{\Phi})$ ) having a minimum value, wherein said cost function having the minimum value is a function of an optimal estimated frequency ( $\hat{f}$ ) and an optimal estimated phase ( $\hat{\Phi}$ ).~~The communications channel of claim 15, wherein the selector determines the minimum value cost function by selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated frequency ( $\hat{f}$ ).~~

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26. (Original) The communications channel of claim 25, wherein the selector determines the minimum value cost function by selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency ( $\hat{f}$ ) and an optimal estimated phase ( $\hat{\Phi}$ ).

27. (Currently Amended) The communications channel of claim ~~145~~25, wherein the selector determines the minimum value cost function by selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated phase ( $\hat{\Phi}$ ).

28. (Original) The communications channel of claim 27, wherein the selector determines the minimum value cost function by selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency ( $\hat{f}$ ) and an optimal estimated phase ( $\hat{\Phi}$ ).

Claims 29-38 (cancelled).

39. (Currently Amended) A disk drive system for an optimal one-shot phase and frequency estimation for timing acquisition for signals transmitted over a communications channel, the system comprising:

rotating magnetic media for storing data;

a motor for rotating the magnetic media;

a recording head for transmitting data;

an actuator for positioning the recording head; and

a communications channel for communicating data to be stored on or read from the recording media, wherein the communications channel further comprises a sampler for sampling a preamble comprising a known string of data bits, a first calculator for estimating the sampled preamble ( $\bar{Y}$ ), a second calculator for calculating a plurality of cost functions ( $C(\hat{f}, \hat{\Phi})$ ) as a function of the estimated frequency ( $\hat{f}$ ) and the estimated phase ( $\hat{\Phi}$ ) by varying at least one of the estimated frequency ( $\hat{f}$ ) or estimated phase ( $\hat{\Phi}$ ), and a selector for determining the cost function

( $C(\hat{f}, \hat{\Phi})$ ) having a minimum value, wherein said cost function having the minimum value is a function of an optimal estimated frequency ( $\hat{f}$ ) and an optimal estimated phase ( $\hat{\Phi}$ ), and wherein the estimated preamble further comprises an estimated amplitude ( $\hat{A}$ ), an estimated frequency ( $\hat{f}$ ), and an estimated phase ( $\hat{\Phi}$ ). ~~The system of claim 29,~~ wherein the selector determines the minimum value cost function by selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated frequency ( $\hat{f}$ ).

40. (Original) The system of claim 39, wherein the selector determines the minimum value cost function by selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency ( $\hat{f}$ ) and an optimal estimated phase ( $\hat{\Phi}$ ).

41. (Currently Amended) The system of claim ~~[29]~~39, wherein the selector determines the cost minimum value function by selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated phase ( $\hat{\Phi}$ ).

42. (Original) The system of claim 41, wherein the selector determines the minimum value cost function by selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency ( $\hat{f}$ ) and an optimal estimated phase ( $\hat{\Phi}$ ).

Claims 43-52. (Cancelled)

53. (Currently Amended) A communications channel for an optimal one-shot phase and frequency estimation for timing acquisition for signals transmitted over the communications channel, the communications channel comprising:

a means for sampling a preamble comprising a known string of data bits;

a means for estimating the sampled preamble ( $\bar{Y}$ ), the estimated preamble further comprising an estimated amplitude ( $\hat{A}$ ), an estimated frequency ( $\hat{f}$ ), and an estimated phase ( $\hat{\Phi}$ );

a means for calculating a plurality of cost functions ( $C(\hat{f}, \hat{\Phi})$ ) as a function of the estimated frequency ( $\hat{f}$ ) and the estimated phase ( $\hat{\Phi}$ ) by varying at least one of the estimated frequency ( $\hat{f}$ ) or estimated phase ( $\hat{\Phi}$ ); and

a means for selecting the cost function ( $C(\hat{f}, \hat{\Phi})$ ) having a minimum value, wherein said cost function having the minimum value is a function of an optimal estimated frequency ( $\hat{f}$ ) and an optimal estimated phase ( $\hat{\Phi}$ )~~The communications channel of claim 43~~, wherein means for selecting selects the minimum value cost function by selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated frequency ( $\hat{f}$ ).

54. (Original) The communications channel of claim 53, wherein the means for selecting selects the minimum value cost function by selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency ( $\hat{f}$ ) and an optimal estimated phase ( $\hat{\Phi}$ ).

55. (Currently Amended) The communications channel of claim ~~43~~53, wherein the means for selecting selects the minimum value cost function by selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated phase ( $\hat{\Phi}$ ).

56. (Original) The communications channel of claim 55, wherein the means for selecting selects the minimum value cost function by selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency ( $\hat{f}$ ) and an optimal estimated phase ( $\hat{\Phi}$ ).

Claims 57-66. (Cancelled)

67. (Currently Amended) A computer program product encoded with a computer program for performing a method for an optimal one-shot phase and frequency estimation for timing acquisition for signals transmitted over a communications channel, the method comprising:

sampling a preamble comprising a known string of data bits;

estimating the sampled preamble ( $\bar{Y}$ ), the estimated preamble further comprising an estimated amplitude ( $\hat{A}$ ), an estimated frequency ( $\hat{f}$ ), and an estimated phase ( $\hat{\Phi}$ );

calculating a cost function ( $C(\hat{f}, \hat{\Phi})$ ) as a function of the estimated frequency ( $\hat{f}$ ) and the estimated phase ( $\hat{\Phi}$ );

varying at least one of the estimated frequency ( $\hat{f}$ ) or estimated phase ( $\hat{\Phi}$ ) to calculate a plurality of cost functions; and

selecting the cost function ( $C(\hat{f}, \hat{\Phi})$ ) having a minimum value, wherein said cost function having the minimum value is a function of an optimal estimated frequency ( $\hat{f}$ ) and an optimal estimated phase ( $\hat{\Phi}$ ). ~~The computer program product of claim 57, wherein selecting the minimum value cost function further comprises selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated frequency ( $\hat{f}$ ).~~

68. (Original) The computer program product of claim 67, wherein selecting the minimum value cost function further comprises selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency ( $\hat{f}$ ) and an optimal estimated phase ( $\hat{\Phi}$ ).

69. (Currently Amended) The computer program product of claim ~~57~~67, wherein selecting the minimum value cost function further comprises selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated phase ( $\hat{\Phi}$ ).

70. (Original) The computer program product of claim 69, wherein selecting the minimum value cost function further comprises selecting a second minimum cost function from the plurality

of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency ( $\hat{f}$ ) and an optimal estimated phase ( $\hat{\Phi}$ ).

Claims 71-80. (Cancelled)

81. (Currently Amended) A disk drive system for an optimal one-shot phase and frequency estimation for timing acquisition for signals transmitted over a communications channel, the system comprising:

means for storing data;

means for rotating the means for storing;

means for transmitting data to and from the means for storing;

means for positioning the means for transmitting data; and

means for communicating data to be stored on or read from the means for storing, wherein said means for communicating further comprises means for sampling a preamble comprising a known string of data bits, means for estimating the sampled preamble ( $\bar{Y}$ ), means for calculating a plurality of cost functions ( $C(\hat{f}, \hat{\Phi})$ ) as a function of the estimated frequency ( $\hat{f}$ ) and the estimated phase ( $\hat{\Phi}$ ) by varying at least one of the estimated frequency ( $\hat{f}$ ) or estimated phase ( $\hat{\Phi}$ ), and means for determining the cost function ( $C(\hat{f}, \hat{\Phi})$ ) having a minimum value, wherein said cost function having the minimum value is a function of an optimal estimated frequency ( $\hat{f}$ ) and an optimal estimated phase ( $\hat{\Phi}$ ), and wherein the estimated preamble further comprises an estimated amplitude ( $\hat{A}$ ), an estimated frequency ( $\hat{f}$ ), and an estimated phase ( $\hat{\Phi}$ ).  
~~The system of claim 71, wherein the means for selecting determines the minimum value cost function by selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated frequency ( $\hat{f}$ ).~~

82. (Original) The system of claim 81, wherein the means for selecting determines the minimum value cost function by selecting a second minimum cost function from the plurality of

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first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency ( $\hat{f}$ ) and an optimal estimated phase ( $\hat{\Phi}$ ).

83. (Currently Amended) The system of claim ~~74~~81, wherein the means for selecting determines the cost minimum value function by selecting a plurality of first minimum cost functions such that each of the first minimum cost functions has a different estimated phase ( $\hat{\Phi}$ ).

84. (Original) The system of claim 83, wherein the means for selecting determines the minimum value cost function by selecting a second minimum cost function from the plurality of first minimum cost functions, and wherein the second minimum cost function is a function of an optimal estimated frequency ( $\hat{f}$ ) and an optimal estimated phase ( $\hat{\Phi}$ ).